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(71) Applicants
Sim Bianca Società Industria Meccanica S.r.l.,
2, Via Marescalca,
44042 Cento,
Italy.
(72) Inventors
Vincenzo Cavana
(74) Agents
Keith W. Nash

(54) **Machine for emptying sacks**

(57) In a sack-emptying machine, a loading box (1) which is open at the bottom has sack-admission aperture (201) in which a sack-supporting table (4) is pivotably mounted around a horizontal transverse tipping axis (5), being able to be swung alternately into an approximately horizontal sack-receiving position and into an approximately perpendicular or inclined sack-emptying position. In the sack-receiving position the sack-supporting table (4) projects out from the loading box (1) via its front section, while its rear section extends inside the loading box (1) up to a sack-ripping device (11). In the sack-emptying position the sack-supporting table (4) closes off the sack-admission aperture (201) in the loading box (1), and the sack is suspended by prongs (8). In a modification the table is in two parts pivotally movable above the box from a horizontal position in which a sack is slit between the two parts and a V-shaped sack emptying and box closing position.

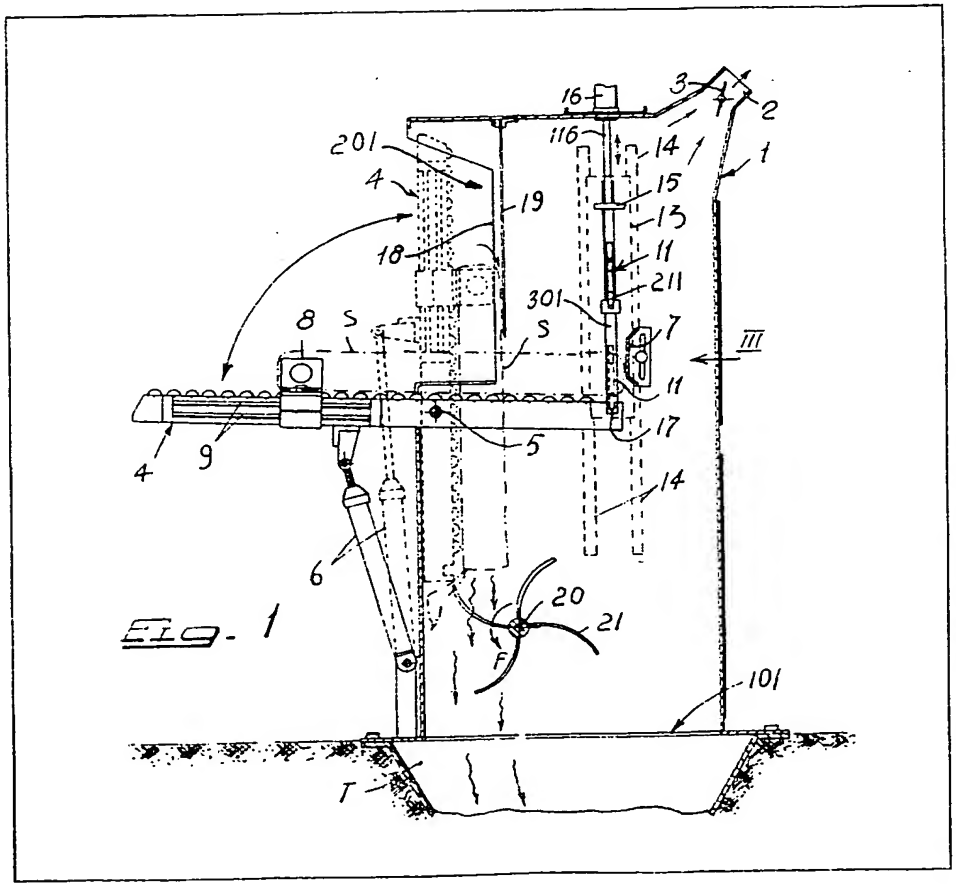

Fig. 1

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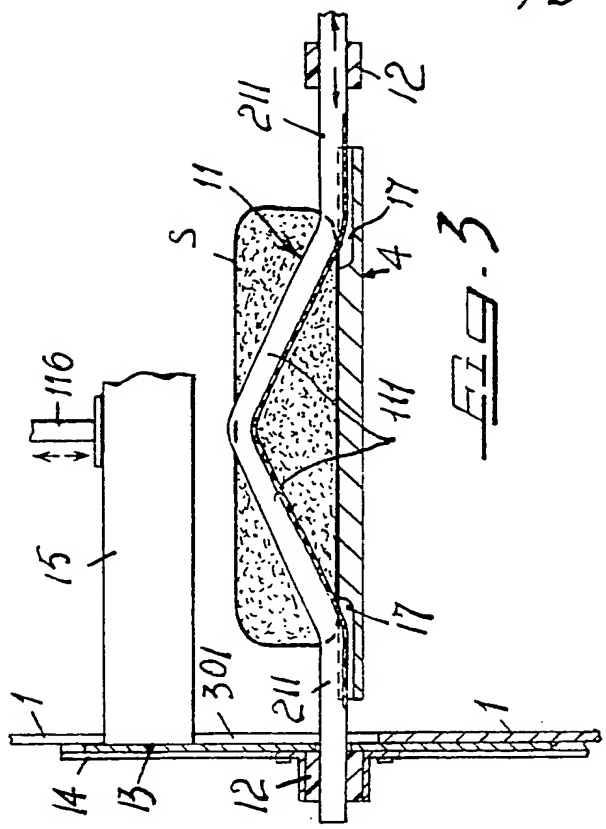

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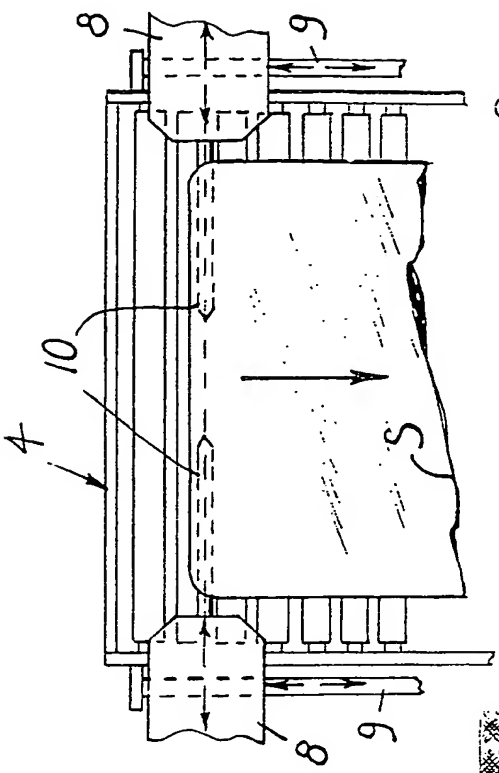

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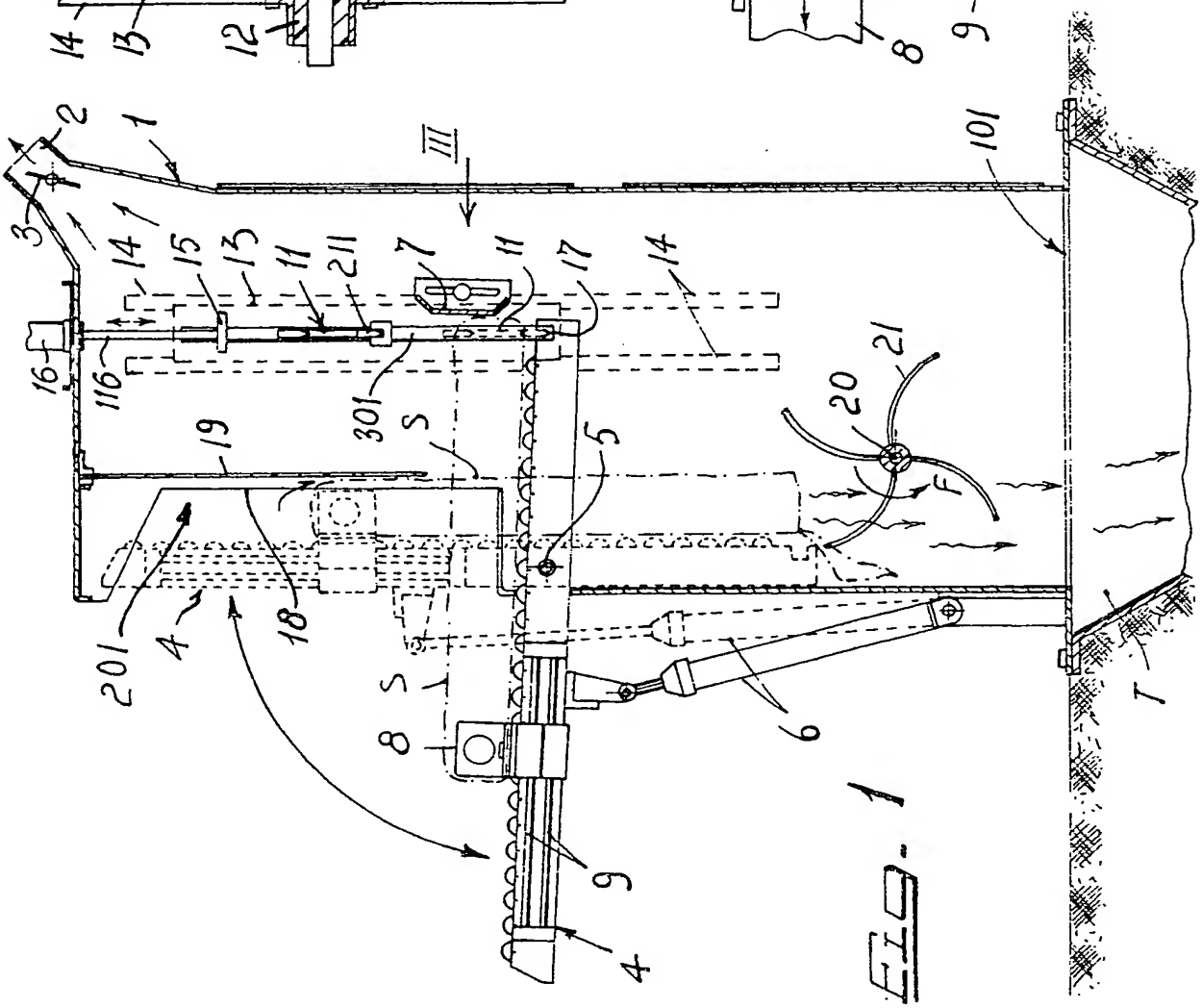

Фиг. 1

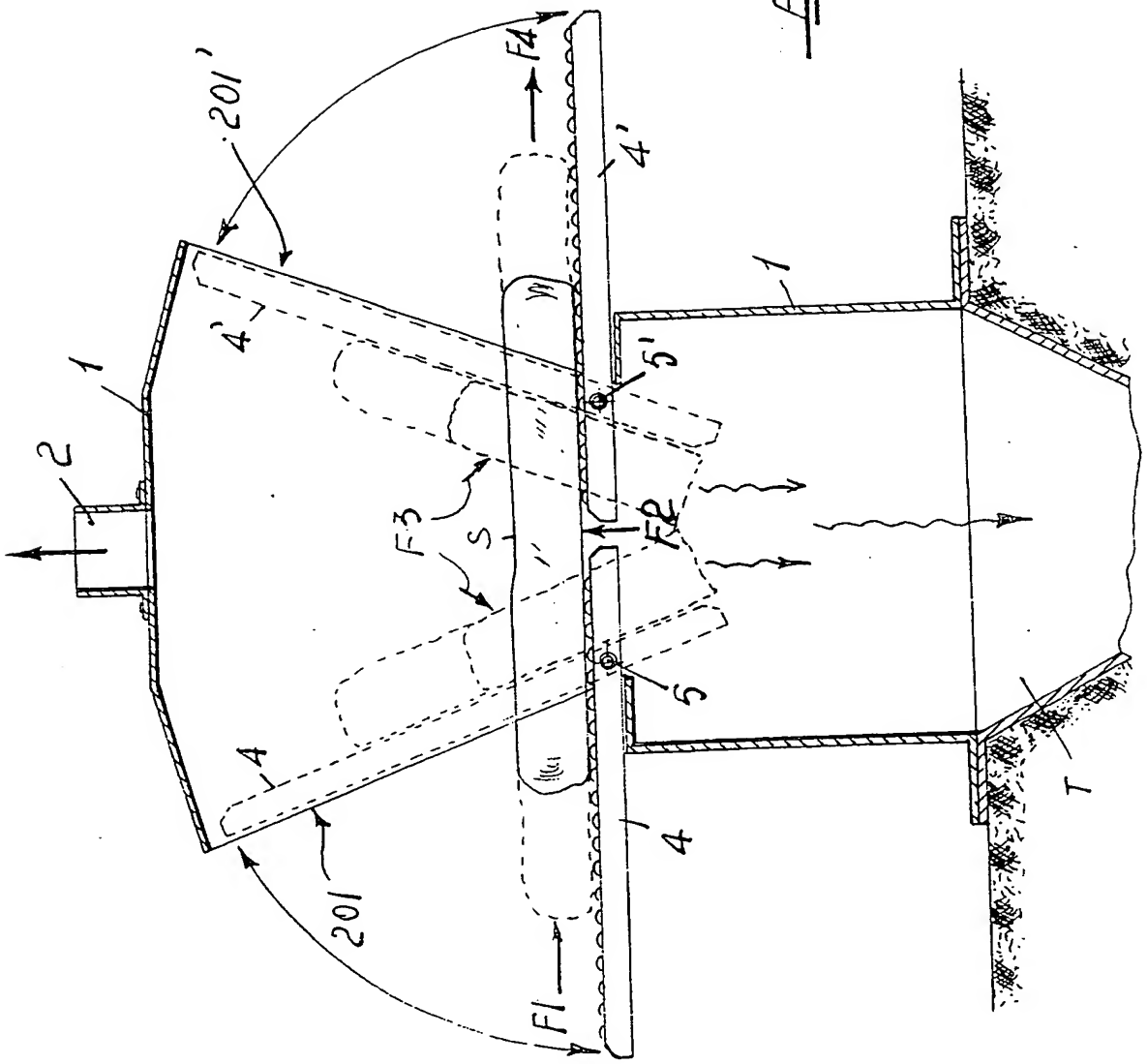

Fig. 4

SPECIFICATION

Machine for emptying sacks

Field of invention

The invention relates to sack emptying machines.

Background to the invention

Fully automatic sack emptying machines are already known and used but are expensive and take up considerable space. The present invention seeks to provide a simple and compactly built machine of this kind, which may be fully automatic but is preferably a semi-automatic machine, which may be produced at low cost, and which is intended for smaller and medium sized businesses which cannot contemplate procuring fully-automatic sack emptying machines of the type already known, for reasons of space and cost.

The invention

According to the present invention a sack emptying machine is characterised by a loading box which is open at the bottom, with a lateral sack admission aperture and with a sack supporting table pivotably mounted around a horizontal transverse tipping axis in the lower region of the sack admission aperture and able to tilt from an approximately horizontal sack receiving position in which a front section of the table, which bears a sack suspending device, projects out from the loading box and a rear section of the table extends into the interior of the loading box up to a sack ripping device, and into an approximately vertical sack emptying position in which the table closes off the sack admission aperture.

Preferably the movements of the sack suspending device, the sack ripping device and the sack supporting table are controlled in a known manner by a control programme which is switched on in a semi-automatic version of the machine by an operator (and which is switched on automatically in a fully-automatic version of the machine as a sack is fed into it) to enable the machine to carry out one operating cycle.

In the semi-automatic version of the sack emptying machine a sealed sack which is to be emptied is laid by an operator on the front section of the sack supporting table which projects out from the loading box and is approximately horizontal in the sack receiving position. The sack is pushed sufficiently far inside, preferably against an end stop, for the inner end of the sack to reach the vicinity of the sack ripping device. The operator then initiates an operating cycle of the sack emptying machine by switching on the control programme. During this operating sequence the sack is first seized by the sack suspending device at its outer end and is ripped open at its inner end by the sack ripping device. The sack supporting table is then tipped into an approximately vertical position for emptying the sack. In the vertical position it closes off the sack admission aperture in the loading box. The sack now hangs by its closed end from the sack suspending device, down inside the loading box, and is emptied through the now open lower ripped end, into the loading hopper disposed beneath the loading box. The sack supporting table is then tipped back into its approximately horizontal sack receiving position and the sack is released by the sack suspending device. This concludes the operating cycle of the sack emptying machine. The operator takes the empty sack from the sack supporting table, lays a new, sealed and full sack on the table and initiates another operating cycle.

The supporting table, suspending device and ripping device can be of any suitable design. In a preferred embodiment the sack supporting table is equipped with a roller bed and can be pivoted by means of at least one hydraulic or pneumatic cylinder. The sack suspending device consists of two prongs which can be moved towards and away from each other, for instance, with the aid of hydraulic or pneumatic cylinders, and which are mounted coaxially with each other on opposite sides of the sack supporting table, and can be pushed into the front end of the full sack lying on the sack supporting table, and withdrawn from it to release the sack after emptying.

A preferred form of sack ripping device consists of a blade which can be moved up and down which is arranged transversely to and above the sack supporting table when this is in the sack receiving position. The blade has a central section which is bent upwardly to form a shallow inverted V-shape, corresponding approximately to the width of the sack to be ripped open. In a particularly preferred embodiment the lower cutting edge of the blade has saw teeth, and the blade is mounted so that it can be moved in its longitudinal direction and can be operated with a to and fro movement.

The invention will now be described by way of example with reference to and as illustrated in the accompanying drawings.

In the drawings

Figure 1 is a side view partly in cross section of a sack emptying machine embodying the invention,

Figure 2 is a plan view of the sack supporting table in the vicinity of the sack suspending device of the machine of Figure 1,

Figure 3 is a front view of the sack ripping device viewed in the direction of arrow III in Figure 1, and

Figure 4 is a side view partly in cross section of another sack emptying machine also embodying the invention.

Detailed description of the drawings

The sack emptying machine shown in Figures 1 to 3 consists of a loading box 1, which has a lower opening 101 and is situated above a loading hopper T. In a modified version (not shown), the loading box 1 is mounted so that it can be moved on running wheels, and can be arranged above different loading hoppers T. The upper part of the loading box 1 is connected via a suction line 2 to a dust removing fan (not shown). Dust removal can be controlled by means of a throttle valve 3 in the suction line 2.

In the upper part of the front wall of the loading box 1 there is a sack admission aperture 201 which

continues into corresponding cut-outs 18 in the two side walls of the box. A sack receiving table 4 is pivotably mounted around a transverse horizontal tipping axis 5 in the lower region of the aperture 201. The sack receiving table 4 has a roller bed on its upper surface and can be swung by means of a hydraulic or pneumatic cylinder from a sack receiving position (shown in Figure 1 by solid lines) into a sack emptying position (shown in Figure 1 with dashed lines) and back agan. In its lowered, sack receiving position the sack supporting table 4 is approximately horizontal. Ideally the table is inclined slightly downwardly towards the interior of the loading box 1 with its front section projecting out from the box. The opposite rear section of the table 4 will therefore extend into the interior of the box its travel being terminated by an end stop 7, which can be adjusted vertically and/or longitudinally.

In its raised, approximately vertical sack emptying position, the front section of the supporting table 4 closes off the sack admission aperture 201. The front section is now the upper section, whilst its rear section extends downwardly from the tipping axis 5 and typically rests against the inner face of the front wall of the loading box 1.

On the section of the sack supporting table 4 which extends outwardly and is at the front in the sack receiving position, there is a sack suspending device which has two prongs 10 disposed coaxially with each other on opposite sides of the table 4. Each prong 10 is mounted in a housing 8 so that it can be displaced longitudinally and can be moved in and out by means of a displacement device (not shown). Typically the latter is a hydraulic or pneumatic cylinder. The two housings 8 are mounted displaceably on longitudinally extending guide rods 9 attached laterally to the sack supporting table 4, so that they can be adjusted to the length of the sacks, one of which is shown at S, which are to be emptied.

Inside the loading box 1, above the rear end of the sack supporting table 4 when the latter occupies the sack receiving position, there is a sack ripping device which consists of a blade 11 extending transversely to the sack supporting table 4. This blade is bent into a shallow inverted V-shape with symmetrical laterally sloping blade arms 111 which continue on aligned straight blade sections 211. The downwardly directed cutting edge of the blade 11 is formed with saw-teeth. The length of the central V-shaped section of the blade formed by the blade arms 111 corresponds approximately to the width of the sack S to be ripped open, as can be seen particularly clearly in Figure 3.

The straight end sections 211 of the blade 11 pass through vertical slits 301 in the side walls of the loading box 1 so as to be displaceable in external guide sleeves 12. The guide sleeves 12 are attached to blade holding plates 13 which are movably mounted in vertical guides 14 on the external faces of the side walls of the loading box 1. The two blade holding plates 13 are connected to each other above the blade 11 by means of a transverse supporting beam 15 which passes through the slits 301. The piston rod 116 of a hydraulic or pneumatic cylinder 16 attached to the loading box 1 acts on the centre of the supporting beam 15, so that the blade holder 12, 13, 15 together with the blade 11 can be moved up and down. At the same time the blade 11 is slidable longitudinally to and fro in the bearing sleeves 12, that is, in the longitudinal direction of the aligned straight end sections 211. A suitable drive mechanism (not shown) may be attached, for example, to one of the external blade holding plates to oscillate the blade backwards and forwards. The side wall of the loading box 1 and the blade holding plate 13 with its guides 14 are omitted from the right hand side of Figure 3 for clarity.

In the lower part of the loading box 1 there is a shaft 20 with sack beaters 21, revolving in the direction of the arrow F.

The moving parts of the sack emptying machine (or actuating mechanisms for these parts) are controlled by a control sequence or control programme which is switched on by an operator at the beginning of each operating cycle.

To empty a full, sealed sack S the sack supporting table 4 is swung into its horizontal position and the sack S is placed by the operator on the front, external, protruding section of the sack supporting table 4. To facilitate this, the prongs 10 of the sack suspending device are retracted into their associated housings 8, by drawing them outwardly. The blade 11 of the sack ripping device is raised up into the rest position as shown in solid outline in Figure 1. The operator pushes the sack S on the roller bed of the sack supporting table 4, which slopes slightly down into the interior of the loading box 1 until the inner top end of the sack strikes the end stop 7 and is halted by it.

The operator then initiates the operating cycle of the sack emptying machine by switching on the control programme.

In a modified version, which is not shown, the end stop 7 is provided with limited movement and constitutes the activating element of a switch. The action of pushing the sack S into position on the sack supporting table 4 thus operates the switch and initiates the operating cycle of the sack emptying machine automatically when it strikes against the end stop 7.

Although not shown, a drive may be provided for the roller bed on the sack supporting table 4. In this case, the operator would need only to place the full, sealed sack S onto the externally projecting section of the table 4 and to switch on the drive of the roller bed. The sack S would then be fed into the loading box 1 until it strikes the end stop 7 thereby initiating an operating cycle.

In all of the embodiments described with reference to Figures 1 to 3 the sack emptying machine operates in the following sequence:-

At the end of the running-in movement of the full, sealed sack it is seized at its outermost end by the appropriately adjusted sack suspending device. To this end the prongs 10 are initially moved outwardly in the housings 8 and then inwardly towards each other and are inserted laterally in the sack S, as is shown particularly clearly in Figure 2.

After this the inner end of the sack is ripped open. To achieve this, the transversely aligned, reciprocat-

ing, saw-like blade 11 is lowered briefly towards the sack supporting table 4 under the action of cylinder 16. The downward movement is just sufficient for the straight terminal blade sections 211 to engage in corresponding slots 17 in the sack supporting table 4, as shown in Figures 1 and 3. Figure 3 also shows that the blade only severs the top and opposite side regions of the sack, the lower wall of the sack remaining intact.

After the blade 11 has been lifted up the sack supporting table 4 is tipped into its sack emptying position which closes off the sack admission aperture 201. The sack S, which is firmly held at its upper end by the prongs 10 of the sack suspending device, and which hangs freely with its lower, cut end in the loading box 1, is emptied through the lower opening 101 into a loading hopper which lies beneath it. During this process the lower end of the sack comes to rest in the vicinity of the revolving beaters 21 on the shaft 20, which jolt and vibrate the sack and effect a complete emptying. For the same purpose, other jolting devices may also be provided. Thus, for example, the whole sack supporting table 4, when in its vertical position, may be vibrated by supplying a pulsating fluid pressure to the hydraulic or pneumatic cylinder 6. The sack emptying process can also be enhanced by blowing air into the sack through the tubular prongs 10 of the sack suspending device, or by air being sucked out of the sack by creating a low pressure in the loading box 1.

The sealing of the loading box is ensured by a flexible curtain 19 hanging from the top of the loading box 1 in the vicinity of the sack admission aperture 201 and formed from rubber or plastics or like sheet material, against which the emptying sack comes to rest. Any dust which arises during unloading is sucked away via the line 2.

Finally, the sack supporting table 4 is swung back again with the aid of the hydraulic or pneumatic cylinder 6 into its sack receiving position. Conveniently the prongs 10 are retracted into their associated housings 8 to allow the empty sack to be released.

This concludes the operating cycle of the sack emptying machine. The operator takes the empty sack away from the sack supporting table 4 and lays on it a new full, sealed sack S to be emptied, after which a new operating cycle can be initiated.

The sack emptying machine shown in Figures 1 to 3 is suitable for the semi-automatic operation described, with the operating cycle initiated each time by an operator. A modified verson is shown in Figure 4, which can operate semi-automatically or fully automatically.

In this modified version of the sack emptying machine the loading box 1 arranged above a loading hopper T has a sack admission aperture 201 in its front wall (on the left in Figure 4), and in its opposite, rear wall (on the right in Figure 4) it has a sack exit aperture 201'. Both sack admission aperture 201 and the sack exit aperture 201' have an associated sack supporting table 4 and 4' respectively, which may be tipped around a horizontal, transversely aligned tipping axis 5 or 5' respectively, from a horizontal sack receiving position into an inclined sack emptying position, and back again. In the sack receiving position shown in Figure 4 with fully drawn lines the two sack supporting tables 4, 4' which are equipped with roller beds are mutually aligned and form a single supporting and sliding plane for the sack S. Underneath this supporting plane, in the vicinity of the central dividing gap between the sack supporting tables 4, 4' there is a sack cutting or slitting device (not shown) but indicated by an arrow F2. Each sack supporting table 4, 4' also bears a sack suspending device (not shown) which may be constructed in the same way as the suspending device shown in Figure 1 and 2. The roller beds on the two sack supporting tables 4, 4' may be driven, or other conveying means are provided (not shown), so as to draw the sack S through the loading box 1 on the swung down sack supporting tables 4, 4'.

With the two sack supporting tables 4, 4' in the horizontal sack receiving position, the full, sealed sack S to be emptied is laid on the outwardly projecting section of the sack supporting table 4 associated with the sack admission aperture 201 and is pushed by the operator or moved by means of the roller bed or other sack conveying means in the direction shown by the arrow F1, through the sack admission aperture 201 sufficiently far into the loading box 1 for it to come to rest centrally over the dividing gap between the two sack supporting tables 4, 4', as shown with fully drawn lines in Figure 4.

In this position the two ends of the sack on the associated sack supporting tables 4, 4' are securely held by means of the sack suspending devices (not shown), and the sack S is cut or slit from below in the vicinity of the dividing gap between the two sack supporting tables 4, 4'. After this, the two sack supporting tables 4, 4' are swung into their inclined sack emptying positions shown in Figure 4 with dashed lines. The sack S which has been slit in its central region is thereby lifted up on either side of the slit, i.e. is bent into a V-shape, and is emptied through the loading box 1 into the loading hopper T. The emptying may be enhanced by some type of jolting mechanism, indicated by the arrows F3. After the emptying process, the two sack supporting tables 4, 4' are again swung back into the horizontal sack receiving position in which the sack suspending device releases the empty sack and the latter is pushed out of the loading box 1 through the sack exit aperture 201' in the direction shown by the arrow F2, i.e. in the same entry direction F1, either by the operator or by further roller rotation or by means of other sack conveying means.

With the construction form of the sack emptying machine according to Figure 4, each operating cycle can be initiated by an operator, for semi-automatic operation. In fully automatic operation, each operating cycle is initiated automatically in a known way by the individual sacks which are fed in mechanically, one after another.

CLAIMS

1. Sack emptying machine, characterised by a loading box (1) which is open at the bottom, with a lateral sack admission aperture (201) and with a sack

supporting table (4) pivotably mounted around a horizontal transverse tipping axis (5) in the lower region of the sack admission aperture (201) and able to tilt into an approximately horizontal sack receiving position in which a front section of the table, which bears a sack suspending device (8, 10), projects out from the loading box (1) and a rear section of the table extends into the interior of the loading box up to a sack ripping device (11), and into an approximately vertical sack emptying position in which the table closes off the sack admission aperture.

2. Sack emptying machine as claimed in claim 1, characterised in that the sack supporting table (4) is equipped with a roller bed and is pivoted by means of at least one hydraulic or pneumatic cylinder (6).

3. Sack emptying machine as claimed in claim 1, characterised in that the sack suspending device consists of two prongs (10) which can be moved towards and away from each other and are mounted coaxially with each other on opposite sides of the sack supporting table (4), and can be pushed into the front end of the full sack (S) lying on the sack supporting table (4) in order to engage it, and can be withdrawn from it to release the sack after emptying.

4. Sack emptying machine as claimed in claim 3, characterised in that the prongs (10) of the sack suspending device are hollow and can be connected to the outside air or to a source of blown air.

5. Sack emptying machine as claimed in claim 1, characterised in that the sack ripping device consists of a blade (11), which can be moved up and down and is arranged transversely to and above the sack supporting table (4) when the latter is in its sack receiving position.

6. Sack emptying machine as claimed in claim 5, characterised in that the blade (11) has a central section (111 - 111) bent upwards like a roof, this section corresponding approximately to the width of the sack (S) which is to be ripped open.

7. Sack emptying machine as claimed in claims 5 and 6, characterised in that the lower cutting edge of the blade (11) has saw-teeth, and that the blade (11) is mounted so that it can be displaced in its longitudinal direction and can be operated with a to and fro movement.

8. Sack emptying machine as claimed in claim 1, characterised by an adjustable end stop (7) arranged inside the loading box (1) a short distance behind the sack ripping device, for the sack (S) which has been introduced.

9. Sack emptying machine as claimed in claim 1, characterised by at least one shaking or jolting device (20, 21) for the sack (S) suspended inside the loading box (1).

10. Sack emptying machine as claimed in claim 1, characterised in that the loading box (1) has a sack exit aperture (201') on the opposite side to the sack admission aperture (201), and in the lower region of this sack exit aperture (201').there is a second sack supporting table (4') pivotably mounted around a transverse horizontal tipping axis (5'), the two sack supporting tables (4, 4') appertaining to the sack admission aperture (201) and to the sack exit aperture being able to tip from their horizontal, mutually aligned sack receiving positions, wherein they form a single sack supporting plane, into sack emptying positions inclined towards the inside of the loading box (1) in the form of a V, and each sack supporting table (4, 4') bearing a sack suspending device, whilst a sack ripping device which acts from below upwards is arranged beneath the sack supporting plane in the vicinity of the dividing gap between the two sack supporting tables (4, 4').

New claims or amendments to claims filed on 10th December 1979
Superseded claims 1-10
New or amended claims:-

1. A sack emptying machine comprising a loading box which is open at the bottom, with a lateral sack admission aperture and with a sack supporting table pivotably mounted around a horizontal transverse tipping axis in the lower region of the sack admission aperture and able to tilt firstly into an approximately horizontal sack receiving position in which a front section of the table projects out from the loading box and a rear section of the table extends into the interior of the loading box up to a sack ripping device, and secondly into an approximately vertical sack emptying position in which the table closes off the sack admission aperture, wherein the front section of the table carries a sack suspending device which consists of two prongs which can be moved towards and away from each other and are mounted coaxially with each other on opposite sides of the sack supporting table, and can be pushed into the front end of the full sack lying on the sack supporting table in order to engage it, and can be withdrawn from it to release the sack after emptying.

2. A sack emptying machine as claimed in claim 1, wherein the sack supporting table is equipped with a roller bed and is pivoted by means of at least one hydraulic or pneumatic cylinder.

3. A sack emptying machine as claimed in claim 1 or claim 2, wherein the prongs of the sack suspending device are hollow and can be connected to the outside air or to a source of blown air.

4. A sack emptying machine as claimed in any of claims 1 to 3, wherein the sack ripping device consists of a blade which can be moved up and down and is arranged transversely to and above the sack supporting table when the latter is in its sack receiving position.

5. A sack emptying machine as claimed in claim 4, wherein the blade has a central section bent upwards like a roof, this section corresponding approximately to the width of the sack which is to be ripped open.

6. A sack emptying machine as claimed in claims 4 or 5, wherein the lower cutting edge of the blade has saw-teeth, and the blade is mounted so that it can be displaced in its longitudinal direction and can be operated with a to and fro movement.

7. A sack emptying machine as claimed in any of

claims 1 to 6, including an adjustable end stop arranged inside the loading box a short distance behind the sack ripping device, for the sack which has been introduced.

8. A sack emptying machine as claimed in any of claims 1 to 7, including at least one shaking or jolting device for the sack suspended inside the loading box.

9. A sack emptying machine as claimed in any of claims 1 to 3, wherein the loading box has a sack exit aperture on the opposite side to the sack admission aperture, and in the lower region of this sack exit aperture there is a second sack supporting table pivotably mounted around a transverse horizontal tipping axis, the two sack supporting tables appertaining to the sack admission aperture and to the sack exit aperture being able to tip from their horizontal, mutually aligned sack receiving positions, wherein they form a single sack supporting plane, into sack emptying positions inclined towards the inside of the loading box in the form of a V, and each sack supporting table bearing a two-pronged sack suspending device, whilst a sack ripping device which acts from below upwards is arranged beneath the sack supporting plane in the vicinity of the dividing gap between the two sack supporting tables.

10. A sack emptying machine substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings, or including the modification of Figure 4.

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